BIODIVERSITY ASSESSMENT OF THE PORT LAUNAY MANGROVE, MAHÉ, SEYCHELLES

As part of the Mangrove For the Future mid-sized project by Sustainability for Seychelles

'Community Based Management of the Port Launay Mangrove Ramsar Site in Seychelles'

Consultancy report submitted by:

Dr. Elvina Henriette, Biodiversity Consultant

With contributions from Fatima Sinon and Jill Esparon (Seychelles Agricultural Agency), Vanessa Zialor (S4S), Veronique Thomas and Sophia Thomas (Port Glaud Environment Club)

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1. INTRODUCTION

Biodiversity assessment provides the biological information needed to balance socio-economic and ecological consideration in decision-making process (Bagri et al., 1998, Treweek, 2001) and planning of development and or conservation projects. In addition, it enables adverse environmental impacts to be anticipated, avoided, and mitigated (Bagri et al., 1998). Furthermore, biodiversity assessment calls for monitoring and evaluation which provide data relevant to the further conservation and sustainable use of biological resources.

The current consultancy aims at the provision of baseline biodiversity data to facilitate informed decision-making and conservation of the Port Launay mangrove. It forms part of the project component being implemented by Sustainability for Seychelles (S4S) under the Mangrove for the Future (MFF). The project is intended to build community capacity to lead the sustainable management of the Port Launay Mangrove Ramsar Site.

1.1. Objectives

The objectives of the biodiversity assessment are as follows:

- Conduct inventories on the fauna and flora of the mangrove
- On the basis of the species assessments, identify species and areas for long-term monitoring.

1.2. Scope of work

The scope of the work were:

- Conduct species assessment through inventories of the fauna and flora of the mangrove
- Produce a report including species lists and recommendations for monitoring.

2. METHODOLOGY

2.1. *Approach*

Collection of primary data was through field surveys focussing only on the mangrove area since this was the focus of the consultancy. Surveys were carried out using a combination of observation methods: by kayak, on ground (walking) and drive by.

2.2. Data collection

Data were collected using two inventory methods.

I. Plotless intensive inventory (PLII)

This method is applied only when the observer has sufficient knowledge of the species to be encountered i.e. the observer can identify all or most species encountered. The method consists in exploring within a given stand and recording all species observed until no more species are to be added or until there is no more areas to be explored for the stand within the same locality (Senterre et al 2013).

As the name indicates, this method does not require a plot to be demarcated. The 'plot area' can be assessed approximately and optionally (e.g. distances walked X width of observation area). The time spent on the plot can also be noted by taking a GPS point at the beginning and at the end of the plot inventory.

Each inventory is done in a specific habitat. When the habitat type changes, then a new inventory is conducted for that specific habitat. The inventory stops when representativeness is adequate, i.e. most species have been inventoried. Species abundance was estimated by collecting semi-quantitative data through the 5-levels system 'ROFCA' (i.e. R=Rare, O=Occasional, F=Frequent, C=Common, A=Abundant). All vascular plants and animals encountered were recorded.

II. Plotless rapid inventories (PLRI)

This method is similar to the one above. The only difference is that only the most dominant species and or the species of special concern are recorded (Senterre et al 2013).

2.3. Observation techniques

Most species (e.g. birds, plants, fish) were recorded based on sightings.

Benthic and aquatic invertebrates however were sampled semi-qualitatively using dipping nets. In flowing water, the net was held vertically upon the mangrove bed and an area of the substratum immediately upstream of the net was disturbed by foot. In areas with no flow or in vegetative areas the net was swept through the water or the vegetation. The content of the net was emptied into a white tray for sorting and identification. A hand lens was used to identify small creatures.

Water and soil samples were collected and analysed in the laboratory by staff of the Seychelles Agricultural Agency (SAA).

2.4. Field inventories

Field visits were undertaken between January and March 2015. The inventories were carried out by Dr. Elvina Henriette, Biodiversity Consultant and accompanied on various occasions by Ms Vanessa Zialor (S4S Project Manager), Mrs Veronique Thomas and Sophia Thomas (PGEC).

The following data were collected:

a. Biological/ecological characteristics:
    i. Species inventory: aquatic and terrestrial plant and animal species presence and abundance (rare, frequent, occasional, common, abundant). Species status (native or exotic).
    ii. Dominant and rarest species.
    iii. Habitat types (forested, shrub, unconsolidated bottom, rock bottom etc)
b. Physio-chemical characteristics of water including water quality: pH, salinity, conductivity, colour and nitrates
c. Geomorphological characteristics:
    i. Substrate type (organic or mineral)
    ii. General composition (silt, sand, clay, loam, mud, rubble, rock etc)
    iii. Hydric soil indicators (high organic content, sulphuric odour, organic streaks)
    iv. Substrate colour
d. Hydrological characteristic: water regime and flow (flowing water, standing water, saturated soils, floating mat etc)
e. Threats and disturbances: presence of waste, pollution, drainage, reclamation, farming, algal bloom, salting, clearing, invasive alien species etc

2.5. Data analysis

The data were analysed using Microsoft Excel. All mapping was done using Quantum GIS 1.8.

3. RESULTS

3.1. Biodiversity data collection

A total of 25 survey-inventory points were conducted covering most of the mangrove area (Figure 1, Annex 2). The majority of biodiversity data was collected under this study, one data point was from the Key Biodiversity (KBA) project (Senterre et al., 2013) and additional species were added from the Ramsar information sheet (GoS 2004).

3.2. Baseline Environmental Conditions of Port Launay wetland

3.2.1. Wetland attributes

i. General description

The Port Launay wetland is located on the North-west coast of Mahé in Seychelles where it receives a mean annual rainfall of over 2000 mm per year (MET Office 2013). The Port Launay wetland was declared Seychelles' first Ramsar site in 2004 (Ramsar website). The Ramsar site (124 ha) stretches from the lagoon and the coral reef-fringe to the NNW side of L'Islette, enclosing the lower slopes (below the 10 m contour) of the surrounding hills on the eastern and westerns sides, and the lower reaches of five permanent rivers (Figure 2). The Port Launay wetland is transitional between the terrestrial and aquatic systems where the water table is at the surface and the land is covered by shallow water supporting predominantly hydrophytes like mangroves.

ii. Habitat types

The wetland consists of several habitat types:

Lagoon and reef: The outermost habitat is the marine system consisting of the lagoon and the coral reef-fringe (30 ha altogether) which are exposed to waves and currents of the open ocean. Salinity exceeds 30 parts per thousands, with little dilution nearshore. The lagoon consists of calcareous and sandy floor, and extends to an algal encrusted rocky platform that forms the reef edge and together they support a wide spectrum of marine biota. The lagoon transitions into the estuarine system of tidal habitats.

Intertidal habitats: The intertidal habitats are semi-enclosed by the land and having open access to the sea where it is exposed and flooded daily by tides, and where sea water is diluted by freshwater runoff from the land. The intertidal zone is floored by sandy substrates. Intertidal

habitats buffers stormy seas, slow shoreline erosion, and are able to absorb excess nutrients before they reach the reef and the ocean beyond.

Mangrove: The mangrove (approx. 29 ha) emerges from the seaward intertidal zone (lower zone) and stretches all the way to the upper zone at the foot of the hills where it meets the riverine system (see section 3.2.2.iv. for detailed information on the mangrove).

Rivers: The area is drained by five permanent rivers which flow directly into the mangrove meandering through various channels before reaching the lagoon. Rivière Mare aux Cochons and Rivière Cascade which drain the slopes of the Morne Seychellois National Park (MSNP) join together at ca. 30 m altitude to the north of the wetland and drains through the Port Launay mangrove out to the sea. Rivière Griffiths and the nearby unnamed river flow into the central part of the mangrove. Rivière L'Islette joins the southern part of the mangrove.

Coastal plateau: Coastal plateau adjacent to the mangrove harbouring coastal vegetation.

Lowland rainforest: The Ramsar site includes hill slopes up to 10 m altitude only. These slopes harbor lowland rainforest species like Cinnamon (*Cinnamomum verum*), Indian almond (*Terminalia catappa*) and Takamaka (*Calophyllum inophyllum*).

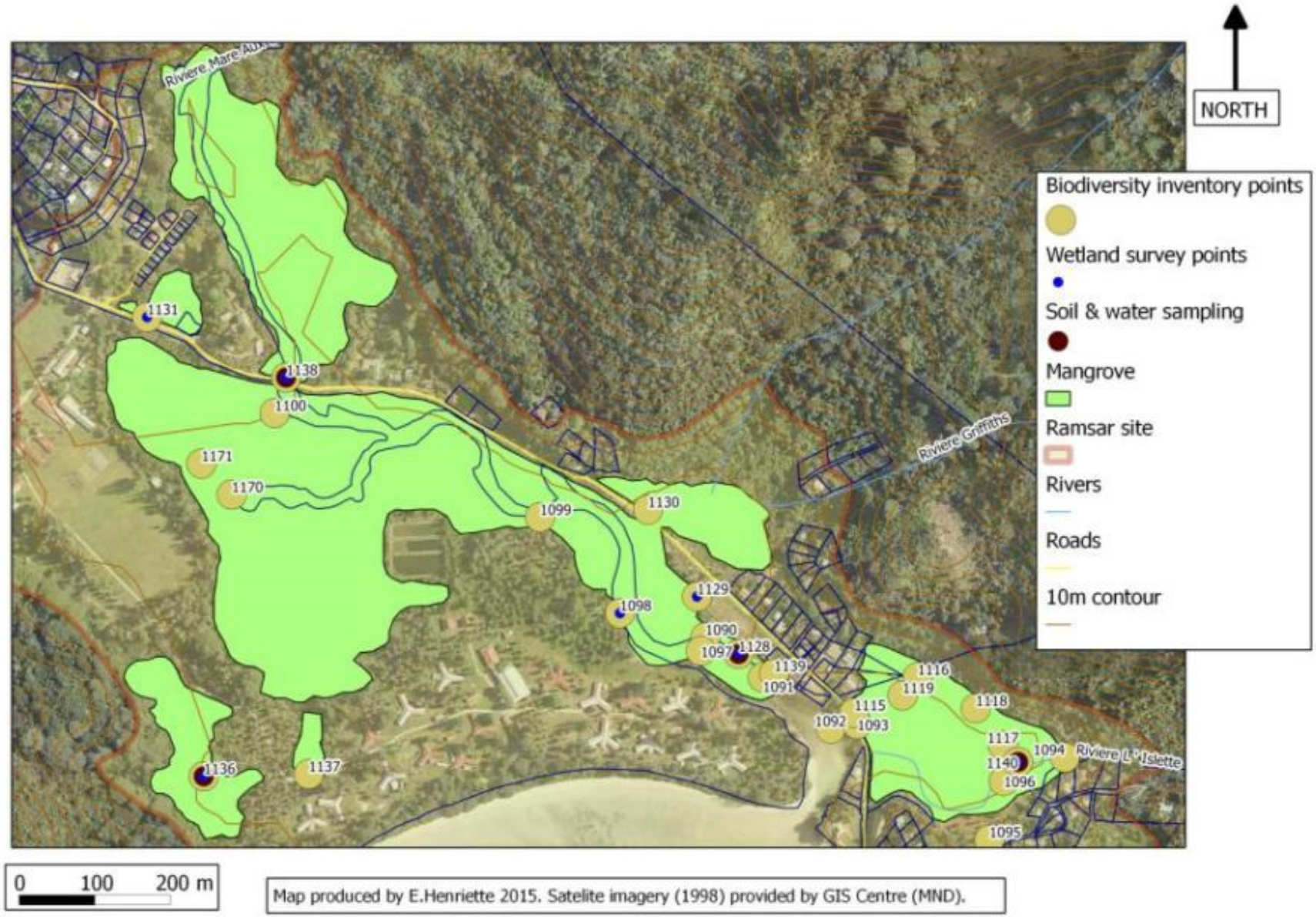

Figure 1: GPS positions of biodiversity inventory points, wetland survey points and soil-water sampling point in the Port Launay mangrove

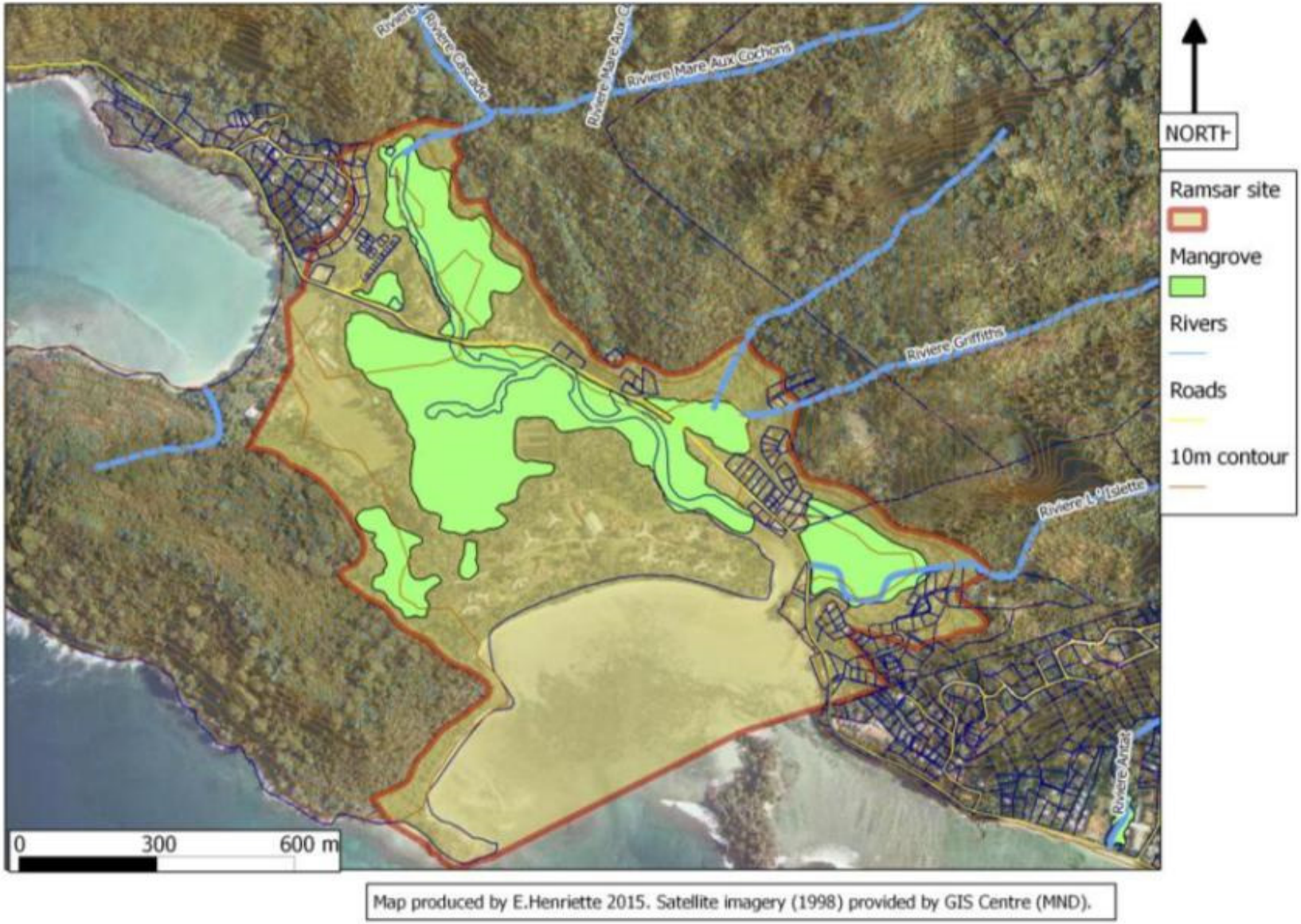

Figure 2: Port Launay Ramsar site and the delimitation of the mangrove.

3.2.2. Mangrove attributes

Mangrove is one of the habitat types found within the Port Launay wetland. Its attributes are detailed below.

i. Hydrological characteristics of the mangrove

The hydrological regime is one of permanent flowing water in the channels that drains through the mangrove, but the inland areas are temporarily inundated depending on the tides, and areas further inland are rarely inundated. Water flow in the mangrove is slow but very fast with the incoming tides. Water depths in the channels range from 0.5 to 1.5 m at low tide. The water is clear, with no turbidity, free from any froth and algae.

ii. Soil characteristics of the mangrove

The type of substrates in the mangrove ranges from mineral - mainly sand with some organic streaks in the seaward zone and gravel at river mouths - to organic materials (mud, clay, loam) on the landward side. Areas in the landward zone that are permanently or regularly inundated contain hydric soils (mud and or clay) with high organic content and in some cases the substrate has sulphuric odour from vegetation decomposition. Areas further inland that are rarely inundated are characterized by loam soil.

iii. Physio-chemical conditions of the substrate and water

a. Soil analysis

Table 1.a: Soil analysis laboratory results for four samples in the Port Launay mangrove

	Sampling sites							
	1136 Behind Spa		1138 R. Mare aux Cochons/Housing Estate		1128 Boat yard		1140 R. L'Islette	
Parameters measured	**Value**	**Class**	**Value**	**Class**	**Value**	**Class**	**Value**	**Class**
pH	7.17	Neutral	7.54	Slightly Alkaline	8.04	Slightly Alkaline	6.19	Slightly acidic
Conductivity (mS/cm)	14.86		3.36		8.05		7.18	
Salinity	13.3	Highly saline	1.7	Saline	4.6	Saline	3.6	Saline
Copper (mg /L)	<10		<10		<10		<10	
Nitrate (mg/l)	<5		<5		<5		<5	
Ammonium (mg/L)	137		46		<20		<20	
Manganese (mg/L)	<0.5		<0.5		<0.5		<0.5	
Iron (mg/L)	<20		<20		<20		<20	

Data highlighted in pink show exceptionally high values

b. Water analysis

Table 1.b: Water analysis laboratory results for four samples in the Port Launay mangrove

	Sampling sites							
	1136 Behind Spa		1138 R. Mare aux Cochons/Housing Estate		1128 Boat yard		1140 Close to R. L'Islette	
Parameters measured	**Value**	**Class**	**Value**	**Class**	**Value**	**Class**	**Value**	**Class**
pH	7.51	Slightly Alkaline	6.81	Neutral	8.03	Slightly Alkaline	6.68	Neutral
Conductivity (mS/cm)	6.22	High	11.49	High	44.6	High	0.41	Optimum
Salinity	1.1	Saline	1.1	Saline	1.3	Saline	1.1	Saline
Copper (mg /L)	<10		<10		<10		<10	
Nitrate (mg/l)	<5		<5		<5		<5	
Ammonium (mg/L)	27		<20		<20		<20	
Manganese (mg/L)	<0.5		<0.5		<0.5		<0.5	
Iron (mg/L)	<20		<20		<20		<20	

Data highlighted in pink show exceptionally high values

pH

The neutral to slightly alkaline pH of the soil and water (Table 1a, b) is typical for coastal wetland as it is in close proximity with seawater and normally under the influence of Calcium Carbonate. This situation will favour the deposition of most nutrients into the wetland floor and will favour the presence of nitrogen and calcium in the water body. The ideal pH for wetland ranges from 6.5 – 8.5 (US-EPA website).

The pH value o f the soil for the sampling point near Rivière L'Islette is however slightly acidic and falls outside the normal pH value for wetlands. This needs to be monitored to assess changes in the pH.

Conductivity and Salinity

Conductivity is caused by dissolved minerals (salts) in water. High conductivity indicates high concentration of dissolved minerals which characterise the water as brackish or saline. Port Launay mangrove is classified as brackish.

The conductivity and salinity of the soil sample is higher compared to the water sample. This can be explained based on the assumption that the wetland floor contains high amount of cation deposition (Na, Ca, Mg and K) than in the water column. The salinity and conductivity of the soil sample behind the Spa (1136) are however very high and warrants further investigation to understand the causes. But it is possible that this patch of mangrove has been cut off from the main patch through either a reduction in its channel that drains water or through reclamation.

Ammonium

The soil and water samples behind the Spa (1136) contain very high level of Ammonium (137 mg/L and 27 mg/L respectively). The natural levels in ground water are usually below 0.2 mg/L. Higher natural contents (up to 3 mg/lL) are found in substrate rich in humic substances. Surface waters may contain up to 12 mg/L (WHO 1996). The soil at the sampling point 1138 near the housing estate and in the channel flowing from Rivière Mare aux Cochons also has a high level of Ammonium (but not in the water) probably due to historical deposition and accumulation of farm runoff uphill and sewage from the housing estate. The reason of the very high Ammonium level behind the Spa is unknown. Ammonia is toxic and considered one of the most important pollutants in the aquatic environment. In agriculture, ammonia is used in the form of commercial fertilisers and its presence in nature can also be from sewage effluents and the excretion of nitrogenous wastes from animals. This may explain its presence at

1138 downstream of farmlands and adjacent to a housing estate. Ammonia also has numerous industrial applications such as treatment applications as well as many other uses in the chemical industry. Natural sources of ammonia include the decomposition of organic matter, gas exchange with the atmosphere, forest fires, animal waste, the discharge of ammonia by biota, and nitrogen fixation processes. The decomposition of vegetation after the death of a large patch of mangrove trees may partly explain the high level of Ammonium behind the Spa.

iv. Vegetation conditions of the mangrove

The bed of the mangrove channels are unconsolidated meaning that it is mainly covered by particles like sand, mud, gravels with little or no vegetation/algal cover. The banks of the channels are covered with vegetation. Mangrove trees dominate this wetland ecosystem due to their ability to survive in both salt and fresh water.

All seven native mangrove species are found at Port Launay but in different abundance. The Asiatic mangrove/Red mangrove (Mangliye rouz, *Rhizophora mucronata*) is extremely abundant and widely distributed from the seaward to landward zone. Whereas the White mangrove (Mangliye pti fey, *Lumnitzera racemosa)* and Cannonball mangrove (Mangliye ponm, *Xylocarpus granatum)* are the least abundant and are mainly found inland, north of the mangrove where it is less brackish. Overall, the mangrove stands are of mixed composition meaning that several species coexist together.

Some areas have very high densities of vegetation (above 70% cover, see point 1131, 1138, 1140, 1170) consisting of both shrubs (woody vegetations less than 5 m high) and trees (woody vegetation more than 5 m high). But some other areas have less than 30% vegetation cover (mainly in the form of shrubs, see 1136, 1128). The area behind the Spa (1136) is one stand where most of the mangrove trees have died although there are signs of recovery as evidenced by young propagules. Some areas of the mangrove particularly the northern sites are well structured with abundant propagules in the above-ground layer, shrubs in the middle layer and trees in the upper layer. There are a few examples of very big trees indicative of an older mangrove forest.

v. *Disturbance/Threats*

There are signs of rubbish in the mangrove. Types of rubbish are household materials like fridges, sinks, carpets, tiles, plastic bags, sippers, cans, bottles, clothes etc (Annex 1). There was also sign of chemical product leakage coming from a nearby house which was being chemically treated (sprayed) in the area above the church towards Rivière L'Islette (point 1095, Annex 1). Cutting and felling of mangrove trees

are also visible as well as ring barking observed on one mangrove species: Nobble-root mangrove (Mangliye lat, *Bruguiera gymnorhiza*). Encroachment in the mangrove for housing development is visible when compared to 1998 satellite map.

3.3. Baseline Biological Conditions of the mangrove

A total of 89 animal (83%) and 18 plant species (17%) were recorded (107 species in total, Table 2, Figure 3). The majority of plants and animals observed were natives (78%) and only 13% were exotics that had naturalised (Figure 4). There were also two migrant bird species and 7 species (invertebrates) where the status is unknown.

Table 2: Summary of biodiversity data collected

	Number of species						
Group	**Native**	**Exotic**	Migrant	Unknown	**KBA species**	Non-KBA species	**Total**
Plants	**17**	**1**			**0**	18	**18**
Animals	**67**	**13**	**2**	**7**	**6**	81	**89**
Birds	*4*	*5*	*2*				*11*
Fish	*17*	*1*					*18*
Invertebrates	*38*	*3*		*7*			*48*
Mammals	*2*	*3*					*5*
Reptiles	*6*	*1*					*7*
Total	**84**	**14**	2	7	**6**	99	**107**
%	78.50	13.08	1.87	6.54	5.61	92.52	

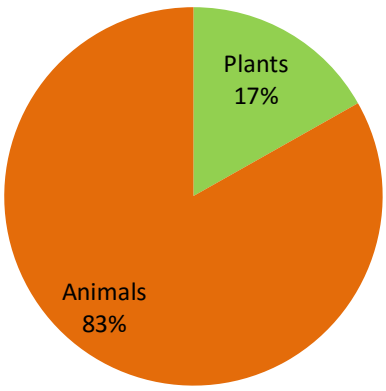

Figure 3: Proportion of animals and plants

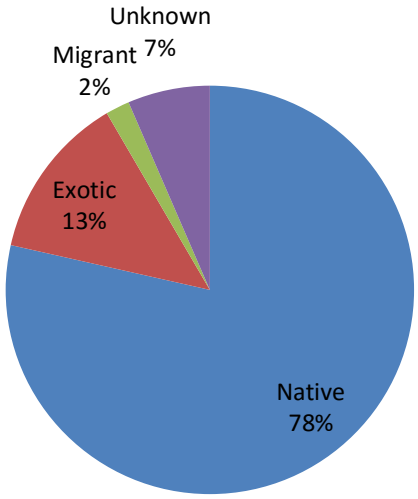

Figure 4: Proportion of native to exotic plants and animals

3.3.1. Faunal biodiversity

89 species of animals (Table 2, 3) were inventoried including 75% (67) natives, 15% (13) exotics, 2% (2) migrants and 8% (7) of unknown status (Figure 5). Five animal groups were recorded (Figure 6) comprising of 11 bird species (12%), 18 fish species (20%), 48 invertebrates (54%), five mammals (6%), and seven reptiles (8%).

Table 3: Species list of wetland associated animals inventoried at Port Launay mangrove

Scientific name	Vernacular name	Origin Status	Rarity	KBA	IUCN	Group
Achatina fulica	Pale-lipped giant African snail, Kourpa	Exotic		No		Invertebrate
Achatina immaculata	Pink-lipped giant African snail, Kourpa	Exotic		No		Invertebrate
Acridotheres tristis	Indian myna, Marten	Exotic	F	No		Bird
Ambassis dussumieri	Malabar glassy perchlet, Bouski	Native	C	No		Fish
Ambassis urotaenia	Banded-tail glassy perchlet, Bouski	Native	C	No		Fish
Anadara antiqyata	Bivalve	Native		No		Invertebrate
Anax guttatus	Amberwing emperor, Sigal	Native	R	No		Invertebrate
Anguilla bicolor	Freshwater eel, Angi	Native	O	No		Fish
Annelidae sp.	Black worm, Lever	Unknown	R	No		Invertebrate
Apis mellifera	African Honey bee, Mous dimyel	Exotic	O	No		Invertebrate
Araneae spp.	Spider, Bib	Native	O	No		Invertebrate
Ardea cinerea	Grey heron, Floranten	Native	R	No		Bird
Boaedon geometricus	Seychelles house snake, Koulev gro lekay	Native		No		Reptile
Butorides striatus	Green-backed heron, Makak	Native	O	No		Bird
Calcinus laevimanus	Hermit crab, Krab	Native	F	No		Invertebrate
Cardina longirostris	Sevret labek long	Native	F	No		Invertebrate
Cardina typus	Sevret	Native	F	No		Invertebrate
Cardisoma carnifex	Giant mangrove crab, Tyongomon	Native	F	No		Invertebrate
Caridina similis	Sevret labek kourt	Native	O	Yes		Invertebrate
Coleura seychellensis	Sheath-tailed bat, Sousouri bannann	Native	O	Yes	Critically Endangered	Mammal
Collocalia elaphra	Seychelles cave swiftlet,	Native	O	No		Bird
Conchylodes ovulalis	Zebra moth	Native	C	No		Invertebrate
Ctena divergens	Bivalve	Native		No		Invertebrate
Diptera sp. 1	Fly, Mous	Unknown	F	No		Invertebrate
Diptera sp. 2	Fly, Mous ver	Unknown	C	No		Invertebrate
Diptera sp. 3	Fly, Mous	Unknown	R	No		Invertebrate
Diptera sp. 4	Fly, Mous	Unknown	O	No		Invertebrate
Diptera sp. 5	Diptera sp. 5	Unknown	F	No		Invertebrate
Drosophilia spp.	Fruit fly, Bigay	Unknown	F	No		Invertebrate
Foudia madagascariensis	Madagascar fody, Sren	Exotic	O	No		Bird
Gafrarium pectinatum	Bivalve	Native		No		Invertebrate

Scientific name	Vernacular name	Origin Status	Rarity	KBA	IUCN	Group
Gafrarium tumidum	Bivalve	Native		No		Invertebrate
Geograpsus stormi	Red mangrove crab, Krab rouz	Native	F	No		Invertebrate
Geopelia striata	Barred ground dove, Tourtrel koko	Exotic	O	No		Bird
Giogenidae sp	Hermit crab, Krab	Native	R	No		Invertebrate
Grapsus tenuicrustatus	Swift-footed crab, Karkasay	Native	O	No		Invertebrate
Haemulidae spp.	Sweetlips	Native	O	No		Fish
Halobates sp.	Water scatter	Native	F	No		Invertebrate
Hemiptera sp.	Pinez	Native	O	No		Invertebrate
Janetaescincus braueri	Borrowing skink, Lezar fen	Native		Yes		Reptile
Kuhlia rupestris	Jungle Perch, Rock Flagtail	Native	O	No		Fish
Lepidoptera sp.	Moth, Lay	Native	O	No		Invertebrate
Ligia exotica	Sea slater	Native	O	No		Invertebrate
Littoraria sp.	Mangrove periwinkle	Native	A	No		Invertebrate
Lutjanus argentimaculatus	Mangrove red snapper	Native	F	No		Fish
Lycognathus seychellensis	Seychelles wolf snake, Koulev zonn	Native		No		Reptile
Mabuya seychellensis	Seychelles skink, Lezar Mangouya	Native		No	Least Concerned	Reptile
Macrobrachium idae	Kanmaron zonn	Native	O	No		Invertebrate
Macrobrachium lar	River prawn, Kanmaron gran lebra	Native	O	No		Invertebrate
Monodactylus argenteus	Miskaden	Native	F	No		Fish
Mugilidae spp.	Mullet fish, Mile	Native	C	No		Fish
Mus musculus	House mouse, Souri	Exotic		No		Mammal
Nectarinia dussumieri	Seychelles Sunbird, Kolibri	Native	O	No		Bird
Numenius phaeopus	Whimbrel, Korbizo	Migrant	O	No		Bird
Ophiocara porocephala	Northern mud gudgeon, Makanbale latet ron	Native	C	No		Fish
Oreochromis mossambicus	Mozambique tilapia, Tilapya	Exotic	F	No		Fish
Orthoptera sp.	Cricket, Grele	Native	F	No		Invertebrate
Pachygrapsus sp.	Shore crab, Krab	Native	F	No		Invertebrate
Pachypanchax playfairii	Golden panchax, Gourzon	Native	C	Yes	Not Evaluated	Fish
Palaemon debilis	Mangrove shrimp, Feeble shrimp	Native	A	No		Invertebrate
Pamelaescincus gardineri	Borrowing skink, Lezar gra	Native		Yes	Least Concerned	Reptile
Pantala flavescens	Wandering glider, Sigal	Native	C	No		Invertebrate
Parioglossus multiradiatus	Larkansyel	Native	O	Yes	Not Evaluated	Fish
Parupeneus sp.	Goatfish, Marswaran	Native	R	No		Fish
Peneopsis japonicus	Shrimp	Native		No		Invertebrate
Peneopsis rectatus	Shrimp	Native		No		Invertebrate
Peneus japonicus	Shrimp	Native		No		Invertebrate
Peneus semisulcatus	Shrimp	Native		No		Invertebrate
Periophthalmus argentilineatus	Barred mudskipper, Kabo soter	Native	C	No		Fish
Phelsuma asiatica	Stripless Day Gecko, Lezar ver	Native	O	No		Reptile
Pluvialis squatarola	Grey plover	Migrant	O	No		Bird

Scientific name	Vernacular name	Origin Status	Rarity	KBA	IUCN	Group
Polistes olivaceus	Yellow wasp, Mous zonn	Native	C	No		Invertebrate
Pteropus seychellensis	Seychelles fruit bat	Native	O	No		Mammal
Quidnipagus palatam	Palate telline, bivalve	Native		No		Invertebrate
Ramphotyphlops brahminus	Brahminy blind snake	Exotic		No		Reptile
Rattus rattus	Black ship rat, Lera	Exotic		No		Mammal
Redigobius bikolanus	Speckled goby	Native	A	No		Fish
Sceliphron fuscum/Delta alluaudi	Mud Dauber/Potter wasp, Mous mason	Native	O	No		Invertebrate
Scylla serrata	Crab, Krab ble	Native	O	No		Invertebrate
Serranidae spp.	Groupers	Native	O	No		Fish
Sesarmops impressum	Crab, Krab larivyer	Native		No		Invertebrate
Streptopelia p. picturata	Madagascar turtle dove, Tourtrel de zil	Exotic	O	No		Bird
Syngnathidae spp.	Pipefish	Native	F	No		Fish
Tenrec ecaudatus	Malagasy tenrec, Tang	Exotic		No		Mammal
Terebralia palustris	Mangrove whelk, Fizo	Native	A	No		Invertebrate
Tetraodontidae sp.	Pufferfish, Bourse	Native	R	No		Fish
Tholymis tillarga	Twister, Sigal	Native	R	No		Invertebrate
Tyto alba	Barn owl, Ibou	Exotic		No		Bird
Uca lactea	Crab, Krab semafot	Native	A	No		Invertebrate

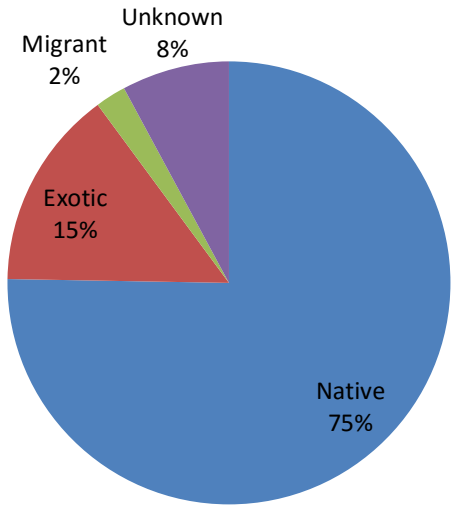

Figure 5: Origin status of animal species in the Port Launay mangrove

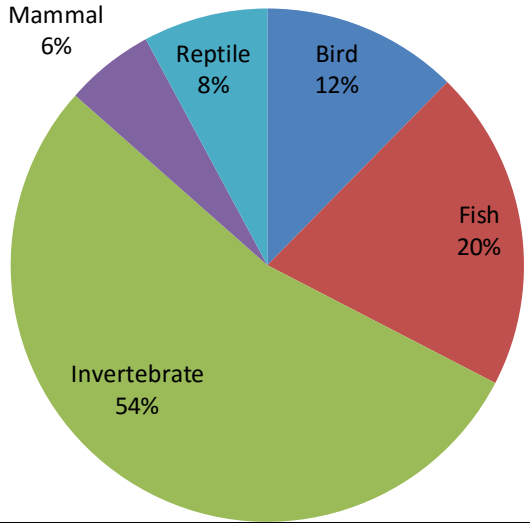

Figure 6: Percentage of animal groups

3.3.2. Floral biodiversity

18 species of plants (Table 2, 4) were inventoried the majority of which were natives 94% (17) natives and 6% (1) exotic (Figure 7). All seven mangrove species that are native to the Seychelles occur at Port Launay along with other wetland associated species like Fouzer lanmar (*Acrostichum aureum*).

Table 4: Species list of plants inventoried at the Port Launay mangrove

Scientific name	Vernacular name	OrigStat	Rarity	KBA
Acrostichum aureum	Fern, Fouzer lanmar	Native	C	No
Avicennia marina	White mangrove, Mangliye blan	Native	C	No
Bruguiera gymnorhiza	Nobble-root mangrove, Mangliye lat	Native	A	No
Ceriops tagal	Yellow mangrove, Mangliye zonn	Native	C	No
Davalia denticulata	Fern, Fouzer	Native	O	No
Derris trifoliata	Deris	Native	C	No
Fungi sp. 1	Lichen	Native	O	No
Fungi sp. 2	Mushroom	Native	R	No
Fungi sp. 3	Lichen	Native	C	No
Fungi sp. 4	Lichen	Native	F	No
Lejeuneaceae sp.	Moss	Native	C	No
Ludwigia octovalvis	Lerb lanmar	Exotic	C	No
Lumnitzera racemosa	Black mangrove, Mangliye pfi fey	Native	C	No
Nephrolepis biserata	Fern, Fouzer taba	Native	F	No
Phymatodes scolopendria	Fern, Kapiler	Native	F	No
Rhizophora mucronata	Asiatic mangrove, Mangliye rouz	Native	A	No
Sonneratia alba	Mangrove apple, Mangliye fler	Native	C	No
Xylocarpus granatum	Cannonball mangrove, Mangliye ponm	Native	C	No

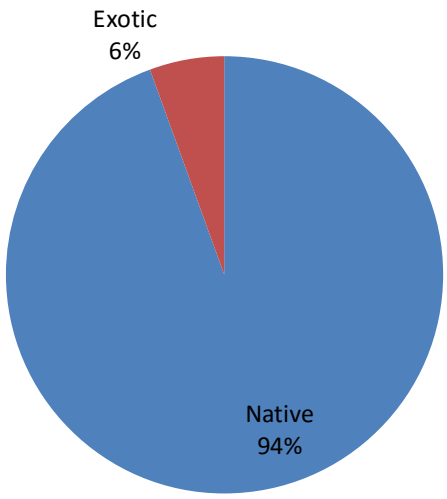

Figure 7: Percentage of native to exotic plant species in the Port Launay mangrove

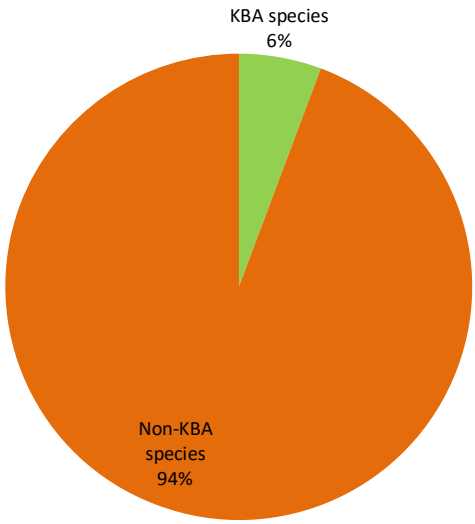

Figure 8: Proportion of KBA to non-KBA species

3.3.3. Rare and or endangered species on site

Rare and threatened species are considered as 'species of special concern' or 'Key Biodiversity Area species' (KBA species). No KBA plant species were recorded in the mangrove, whereas six animal species where identified as KBA species (Table 2, 5, Figure 8). The rarest animal species were the freshwater fish Larkansyel (*Parioglossus multiradiatus*) first discovered in the Seychelles in 2004 and observed in l'Islette river at Port Glaud in 2012 and again during this survey (February 2015), and the Critically Endangered Sheath-tailed bat (*Coleura seychellensis*).

Table 5: Rare and threatened animal species in the Port Launay mangrove and nearby habitats

Scientific name	Vernacular name	OrigStat	Rarity	Group
Caridina similis	Sevret labek kourt	Endemic	O	Invertebrate
Coleura seychellensis	Sheath-tailed bat, Sousouri bannann	Endemic	O	Mammal
Janetaescincus braueri	Borrowing skink, Lezar fen	Endemic	O	Reptile
Pachypanchax playfairii	Golden panchax, Gourzon	Endemic	C	Fish
Pamelaescincus gardineri	Borrowing skink, Lezar gra	Endemic	O	Reptile
Parioglossus multiradiatus	Larkansyel	Endemic	O	Fish

3.4. Species and habitats for monitoring

3.4.1. Species and species assemblages

1. Considering that Port Launay mangrove harbours one of the rarest freshwater fish in the Seychelles and possibly in the world, then it can be recommended that populations of the Parioglossus fish (Larkansyel, *Parioglossus multiradiatus* Annex 1) be monitored over time to locate other populations but also to observe any trends. Other rare species (Table 5) can also be the subject of monitoring.
2. Inventories on aquatic communities of the five rivers will allow for the monitoring of freshwater crustaceans (and other invertebrates) and fish, some of which are good indicators of habitat quality e.g. Golden panchax (Gourzon, *Pachypanchax playfairii*) and the River prawn (Kanmaron gran lebra, *Macrobrachium lar*); and the presence of newcomers like the Rocktail fish (*Kuhlia rupestris*).
3. Inventories of commercial species like the Blue crab (*Scylla serrata*) which are most probably being overharvested will be essential to monitor the occurrence/abundance and distribution of the species. A more sustainable approach to crab harvesting is necessary to prevent the local extinction of the species.

4. A more detailed inventory/assessment is also recommended considering that this current study was a rapid biodiversity assessment and hence there may be species that have not been recorded. Moreover, it was not possible to do night inventories to detect nocturnal species due to the short-timeline of the consultancy.

3.4.2. Habitats

5. In terms of habitats, it is recommended that the area behind the Spa (1136) be monitored yearly to assess mangrove recovery.
6. Changes in the overall Port Launay mangrove structure, composition and density can also be monitored to determine temporal changes and health status. Vegetation maps including health status maps can be produced to compare temporal changes.

3.4.3. Water and Soil quality

7. Water and soil quality in various areas of the mangrove can also be monitored over time to detect abnormal changes and trends and pollution sources. The areas behind the Spa (1136) and the Housing estate (1138) needs continued monitoring to detect the trend in Ammonium.
8. There is a need to raise awareness of nearby farming communities on the use of fertilisers and animal waste management to reduce runoff into the aquatic systems which may have adverse effects on the ecosystems.

Monitoring and research can be done in collaboration with the University of Seychelles where the Port Launay mangrove can be used as a permanent research site.

4. CONCLUSION

The Port Launay mangrove is one of the best mangroves on Mahé, supporting all seven species of mangroves in the Seychelles. It provides ideal habitats for spawning, nursery, feeding and cover for a wide diversity of animals which are found in the mangrove. Since the mangrove is constantly replenished with nutrients transported by freshwater runoff and flushed by the flow of the tides, it supports healthy populations of organisms. The mangrove helps in shoreline stabilisation, storm damage limitation, sediment trapping, water quality maintenance, nutrient retention, and coral reef and lagoon protection. The mangrove and associated wetland habitats are hence important for the healthy functioning of the whole array of ecosystems and offer opportunities to develop sustainable livelihood, tourisms, education and research.

5. REFERENCES

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ANNEX 1: PHOTO DOCUMENTATION

Photo 1: View of mangrove with Morn blanc in the background

Photo 2: All 7 mangrove species exist at Port Launay

Photo 3: A pleasant walk through the mangrove swamp

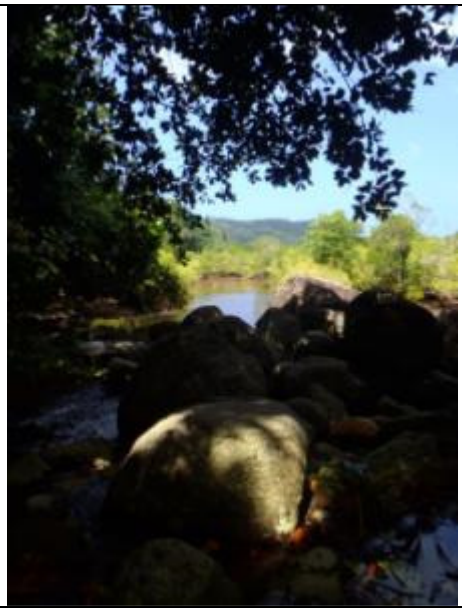

Photo 4: View of the mangrove from Rivière L'Islette

Photo 5: The seaward zone overlooking the boat anchoring area

Photo 6: Different uses by the inhabitants for their livelihood

	
Photo 7: Very clear water of the mangrove	Photo 8: Organic muddy substrate on the mangrove floor
	
Photo 9: Monitoring using a kayak	Photo 10: Some of the plants of the mangrove - mushroom
	
Photo 11: Some of the animals of the mangrove - insects	Photo 12: Some of the animals of the mangrove – Pachygrapsus crab

Photo 13: Some of the animals of the mangrove – Larkansyel (Parioglossus fish)

Photo 14: Some of the animals of the mangrove - Phelsuma

Photo 15: Some of the animals of the mangrove – Hermit crab

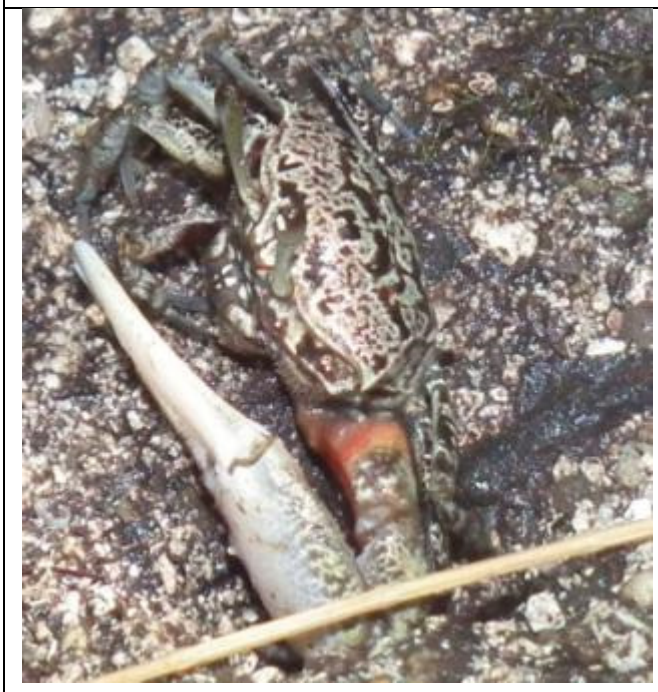

Photo 16: Some of the animals of the mangrove - Crab

Photo 17: Some of the plants of the mangrove - Lichens

Photo 18: Mangrove as habitats - Bird's nest

Photo 19: Threats to the mangrove – cutting/felling

Photo 20: Threats to the mangrove –bark removal

Photo 21: Threats to the mangrove. Pollution – chemical discharge

Photo 22: Threats to the mangrove – Rubbish

Photo 23. Threats to the mangrove – Waste disposal

ANNEX 2: Survey points in Port Launay mangrove

ID	X	Y	Altitude

			(m)
1090	323477	9485058	7
1091	323553	9485005	6
1092	323643	9484937	7
1093	323678	9484943	6
1094	323953	9484899	9
1095	323853	9484790	13
1096	323872	9484868	14
1097	323471	9485040	15
1098	323364	9485090	18
1099	323258	9485217	18
1100	322907	9485355	27
1128	323521	9485036	-33
1129	323466	9485112	17
1130	323401	9485227	21
1131	322738	9485482	19
1115	323674	9484958	38
1116	323758	9485005	42
1117	323871	9484915	52
1118	323835	9484964	53
1119	323738	9484981	54
1136	322813	9484874	-23
1137	322952	9484877	-18
1138	322922	9485402	-15
1139	323568	9485010	-12
1140	323891	9484893	-9
1170	322850	9485247	31
1171	322810	9485288	30